

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-45

Name: Curlew Lake

County: Meade

Legal description: T 3N, R 11E Sec. 2, 10, 11

Location from nearest town: 8 mi. N, 4 mi. E, 1.5 mi. N of New Underwood, SD

Dates of present survey: July 2-4, September 18, 2012

Date last surveyed: June 1-2, September 8, 2011

Management classification: Warmwater permanent

Primary Species: (game and forage)

1. Black Crappie
2. Largemouth Bass
3. Walleye
4. Gizzard Shad
5. _____
6. _____
7. _____

Secondary and other species:

1. Bluegill
2. Yellow Perch
3. Black Bullhead
4. Northern Pike
5. Channel Catfish
6. Common Carp
7. White Sucker

PHYSICAL CHARACTERISTICS

Surface Area: 136 acres

Watershed: 12,800 acres

Maximum depth: 22 feet

Mean depth: 10.2 feet

Lake elevation at survey (from known benchmark): Three feet below full-pool

Ownership of lake and adjacent lakeshore property:

Curlew Lake is owned and managed by the South Dakota Department of Game, Fish and Parks. All land bordering the immediate shoreline, excluding three quarter sections in Section 2 and a small tract of land comprising 10 acres in Section 11, are owned by the Department of Game, Fish and Parks. The 10-acre tract in Section 11 has a written access agreement with the landowner; the three quarter sections in Section 2 do not have active access agreements. There is no record of problems regarding public access across this section of land.

Fishing Access:

Fishing access at Curlew Lake is good for boat and shore anglers alike. Curlew Lake has a well maintained gravel road leading to a relatively new boat ramp with a dock. Shore access is good with trails around much of the lake including the dam face. When conditions are wet, however, trails around the lake are soft and slippery. Typically, emergent and submerged vegetation is sparse around the lake offering shore anglers easy access.

Observations of Water Quality and Aquatic Vegetative:

Rooted aquatic vegetation appears along most of the shoreline. Bulrush is the primary emergent plant species associated with the lake. Coontail and Sago pondweed are the most abundant submersed vegetative species in the lake. Siltation at inlets and shorelines due to natural

erosion around the reservoir and cattle grazing on the private tract and its shoreline has decreased depth and area within the lake. No other pollution problems were identified by department personnel during the 2012 survey.

Observations on condition of structures (i.e. spillway, boat ramps and docks, roads, etc)

All access and regulatory structures appear to be in adequate condition. A new boat ramp was installed in 2005. Also, in 2009 a boat dock was reconditioned by the Rapid City Area Chapter of Walleyes Unlimited and installed with an MOU between them and the SD GF&P.

MANAGEMENT OBJECTIVES

- Objective 1.** To maintain a Walleye fishery with a minimum gill-net CPUE for stock-length Walleye of 10 and a PSD range of 30-60.
- Objective 2.** To maintain a Largemouth Bass fishery with a minimum nighttime electrofishing CPUE for stock-length fish of 20, PSD range between 40 and 70, and growth rates at or near the statewide average.
- Objective 3.** Maintain a Black Crappie population with a trap net CPUE of at least 20 and PSD of greater than 40.

BIOLOGICAL DATA

Day-time boat electrofishing, modified fyke (trap) nets consisting of a 1.3 X 1.5 m frame, 19.1 mm (0.75 in) mesh and a 1.2 X 23 m (3.9 X 75.5 ft) lead and experimental gill (gill) nets (45.7 m [150 ft] long and 1.8 m [6 ft] deep with six 7.6 m [25 ft] panels of bar mesh sizes: 12.7 mm [0.5 in], 19.1 mm [0.75 in], 31.8 mm [1.25 in], 38.1 mm [1.5 in], and 50.8 mm [2.0 in]), were used to accomplish fish surveys at Curlew Lake. Day electrofishing is further discussed in the Gizzard Shad portion of this report. Trap and gill nets were used on July 2-4, 2012 to index adult fish populations in the reservoir (Figure 1). The net sampling consisted of eight trap net nights and two gill net nights and catch data is displayed in Tables 2 and 3. Discussion on selected fish species follows and completes this report.

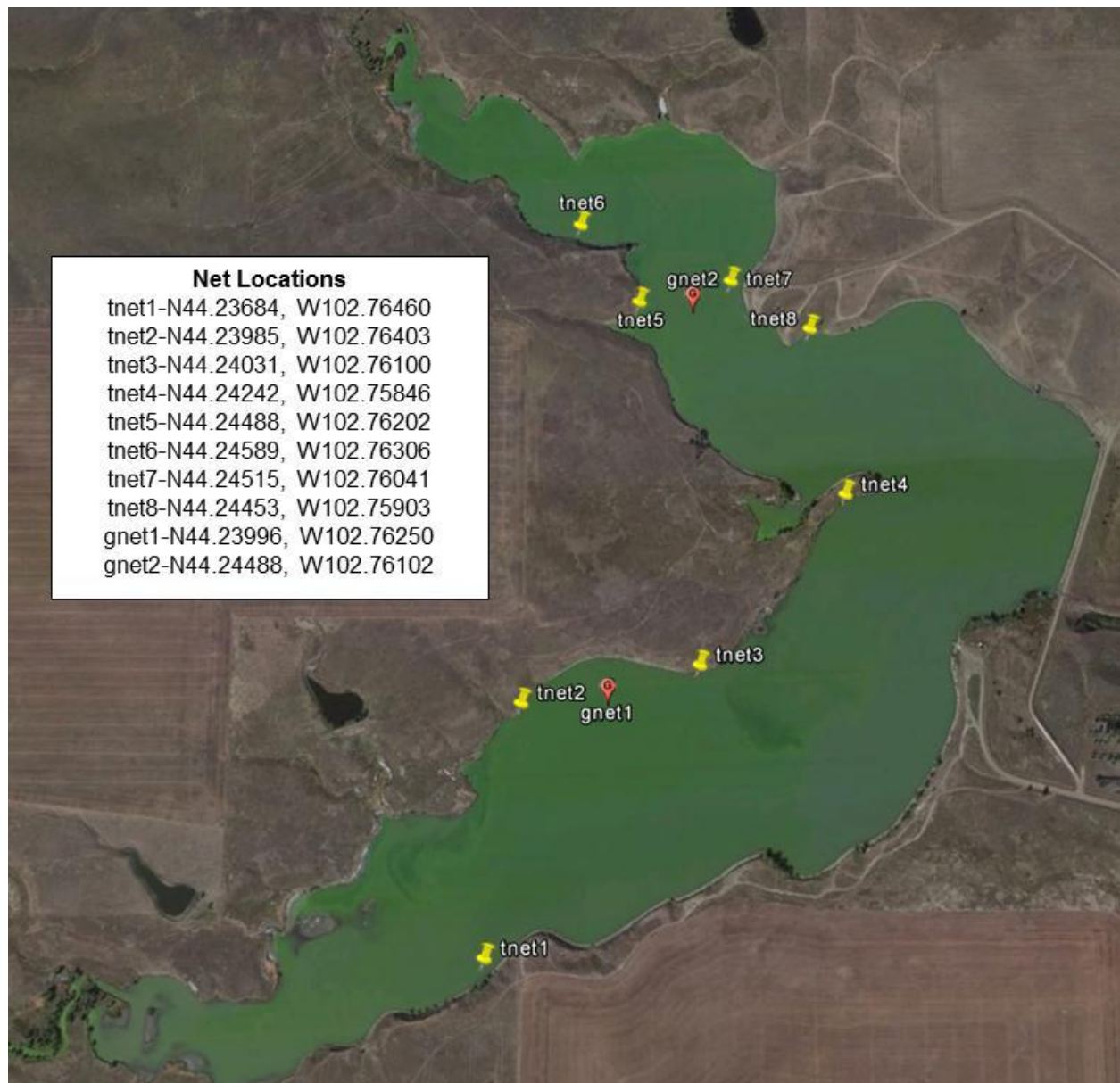


Figure 1. Locations of experimental gill (gnet) and modified fyke (tnet) nets during the annual fisheries survey in Curlew Lake, Meade County, South Dakota, 2012.

Table 1. Site number, number collected per site (No./Site), pedal time, and estimated number per hour of Gizzard Shad sampled using daytime electrofishing from Curlew Lake, Meade County, South Dakota, August 17, 2012

Site	No./Site	Time (sec)	No./hr
1	95	300	1140
2	15	300	180
3	174	300	2,088
4	726	300	8,712
5	9	300	108
Total	1,019	0.42hr	2445.6

Table 2. Species, number sampled (N), catch per unit effort (CPUE), catch per net night of stock-length fish (CPUE-S), proportional stock density (PSD) and proportional stock density of preferred size fish (PSD-P) and relative weight for fish longer than stock length ($Wr \geq S$) for species collected in eight modified fyke nets in Curlew Lake, Meade County, South Dakota, July 2-4, 2012. CPUE values with 80% confidence intervals in parentheses. PSD, PSD-P and $Wr \geq S$ with 90% confidence intervals in parentheses

Species	N	CPUE	CPUE-S	PSD	PSD-P	$Wr \geq S$
Black Bullhead	478	59.8 (21.3)	59.8 (21.3)	3 (1)	0	86.2 (1.7)
Black Crappie	858	107.3 (25.7)	61.1 (14.6)	43 (4)	0	102.5 (2.4)
Bluegill	7	0.9 (0.6)	0.9 (0.6)	86 (28)	43 (39)	102.5 (2.5)
Common Carp	2	0.3 (0.2)	0.1 (0.2)	--	--	73.7 (--)
Northern Pike	4	0.5 (0.3)	0.5 (0.3)	--	--	84.7 (9.6)
Walleye	7	0.9 (0.6)	0.5 (0.3)	0	0	81.6 (3.9)
Yellow Perch	6	0.8 (0.7)	0.8 (0.7)	--	--	80.9 (1.2)
Total	1362					

Table 3. Species, number sampled (N), catch per unit effort (CPUE), catch per net night of stock-length fish (CPUE-S), proportional stock density (PSD) and proportional stock density of preferred size fish (PSD-P) and relative weight for fish longer than stock length ($Wr \geq S$) for species collected in two experimental gill nets in Curlew Lake, Meade County, South Dakota, July 2-4, 2012. CPUE values with 80% confidence intervals in parentheses. PSD, PSD-P and $Wr \geq S$ values with 90% confidence intervals in parentheses

Species	N	CPUE	CPUE-S	PSD	PSD-P	$Wr \geq S$
Black Bullhead	6	3.0 (3.1)	3.0 (3.1)	--	--	78.2 (2.8)
Black Crappie	6	3.0 (3.1)	3.0 (3.1)	--	--	99.9 (10.5)
Channel Catfish	5	2.5 (1.5)	2.5 (1.5)	--	--	80.7 (5.7)
Common Carp	9	4.5 (1.5)	4.5 (1.5)	--	--	88.8 (2.4)
Northern Pike	7	3.5 (7.7)	3.5 (7.7)	--	--	81.4 (5.5)
Walleye	9	4.5 (1.5)	4.5 (1.5)	22 (28)	11 (21)	80.8 (4.0)
White Sucker	1	0.5 (1.5)	0.5 (1.5)	--	--	80.0 (--)
Total	43					

Table 4. Species, number sampled (N), catch per unit effort (CPUE), catch per net night of stock-length fish (CPUE-S), proportional stock density (PSD) and proportional stock density of preferred size fish (PSD-P) and relative weight for fish longer than stock length ($Wr \geq S$) for Largemouth Bass and Walleye collected from 37.7 minutes of electrofishing in Curlew Lake, Meade County, South Dakota, September 18, 2012. CPUE values with 80% confidence intervals in parentheses. PSD, PSD-P and $Wr \geq S$ values with 90% confidence intervals in parentheses

Species	N	CPUE	CPUE-S	PSD	PSD-P	$Wr \geq S$
Largemouth Bass	44	67.7 (31.2)	57.3 (27.4)	35 (14)	8 (8)	118.7 (1.9)
Walleye	25	38.1 (22.4)	30.6 (14.0)	15 (14)	0	93.6 (1.5)
Total	69					

Black Bullhead

In 2012, mean trap net catch per unit effort (CPUE) has decreased to 59.8 from 187.5 in 2011 (Tables 2 and 5). Stock density values indicate a population dominated by small fish with a proportional stock density (PSD) value of only 3 and proportional stock density of preferred-length fish (PSD-P) of 0. Last year, PSD was 4 and PSD-P was 0. Mean relative weight for stock length and larger ($Wr \geq S$) Black Bullheads was low at 86.2. Although no age data was collected, length frequency histograms suggest one or two strong year classes under quality length (Figure 2).

Table 5. Year, number sampled (N), catch per unit effort (CPUE), catch per net night of stock-length fish (CPUE-S), proportional stock density (PSD) and relative weight of fish great than stock length ($Wr \geq S$) for Black Bullhead collected in modified fyke nets in Curlew Lake, Meade County, South Dakota, 2006-2012. CPUE values with 80% confidence intervals in parentheses. PSD, PSD-P and $Wr \geq S$ values with 90% confidence intervals in parentheses

Year	N	CPUE	CPUE-S	PSD	$Wr \geq S$
2006	4	0.6 (0.6)	0.6 (0.6)	100	103.6 (5.0)
2007	1	0.1 (0.2)	0.1 (0.2)	0	77.6 (--)
2008	25	3.1 (1.2)	2.9 (1.3)	13 (12)	105.6 (3.6)
2009	105	17.5 (11.0)	13.5 (10.3)	9 (6)	82.8 (9.4)
2010	532	88.7 (62.8)	37.2 (27.0)	5 (3)	75.4 (2.2)
2011	1500	187.5 (46.9)	185.5 (46.4)	4 (1)	93.6 (2.2)
2012	478	59.8(21.3)	59.8(21.3)	3 (1)	86.2 (1.7)

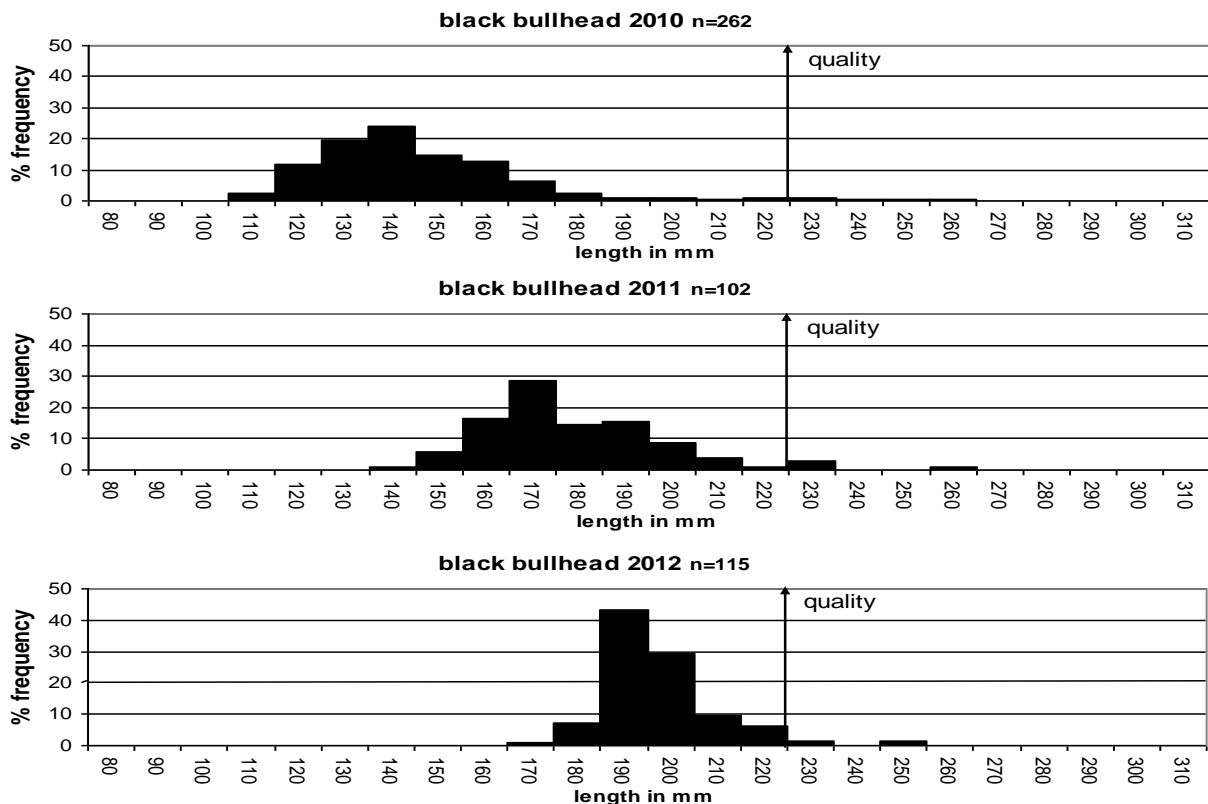


Figure 2. Length frequency histograms of Black Bullheads in modified fyke nets in Curlew Lake, Meade County, South Dakota, 2010-2012.

Black Crappie

Black Crappie abundance has increased from last year. Trap net CPUE was 107.3 compared to 57.5 in 2011 (Tables 2 and 6). Size structure was similar to last year with a PSD of 43 compared to 31 last year. No Black Crappies were sampled over the preferred-length of 250 mm (10 in). Fish condition was good with a mean $W/\pm S$ of 102.5. Growth was slightly higher than the state regional average (Table 7). The length frequency histograms indicate consistent recruitment, with a large year class approaching stock length (Figure 3).

Walleye and Largemouth Bass populations may be affecting the size structure of the Black Crappie population in Curlew Lake. Predator numbers may need to remain high to keep the Black Crappie population within management objectives.

Table 6. Year, number sampled (N), catch per unit effort (CPUE), catch per net night of stock-length fish (CPUE-S), proportional stock density (PSD) and proportional stock density of preferred size fish (PSD-P) and relative weight of fish great than stock length ($Wr \geq S$) for Black Crappie collected in modified fyke nets in Curlew Lake, Meade County, South Dakota, 2007-2012. CPUE values with 80% confidence intervals in parentheses. PSD, PSD-P and $Wr \geq S$ values with 90% confidence intervals in parentheses

Year	CPUE	CPUE-S	PSD	PSD-P	$Wr \geq S$
2007	353.1 (111.7)	216.4 (68.7)	17 (2)	0	100.7 (1.3)
2008	54.6 (15.9)	48.9 (14.3)	9 (3)	2 (1)	107.4 (1.1)
2009	18.0 (10.1)	16.3 (9.0)	38 (8)	2 (2)	101.5 (0.7)
2010	19.8 (10.7)	19.7 (10.6)	34 (7)	2 (2)	93.3 (1.0)
2011	57.5 (25.7)	57.5 (25.7)	31 (4)	2 (1)	101.8 (0.7)
2012	107.3 (25.7)	61.1 (14.6)	43 (4)	0	102.5 (2.4)

Table 7. Year class, age in 2012, sample size (N) and mean back-calculated total length-at-age for Black Crappie collected from Curlew Lake, Meade County, South Dakota, 2012, along with Region 1 mean length-at-age and the South Dakota state-wide Black Crappie mean length-at-age. Standard errors are in parentheses.

Year Class	Age	N	1	2	3	4	5
2011	1	431	93				
2010	2	104	81	154			
2009	3	137	87	154	186		
2008	4	130	94	155	185	201	
2007	5	18	71	129	161	197	208
Pop. mean (SE)		820	85 (4)	148 (6)	178 (8)	199 (2)	208 (0)
Region 1			74 (3)	122 (7)	158 (9)	197 (13)	217 (16)
South Dakota			83 (2)	147 (4)	195 (5)	229 (6)	249 (6)

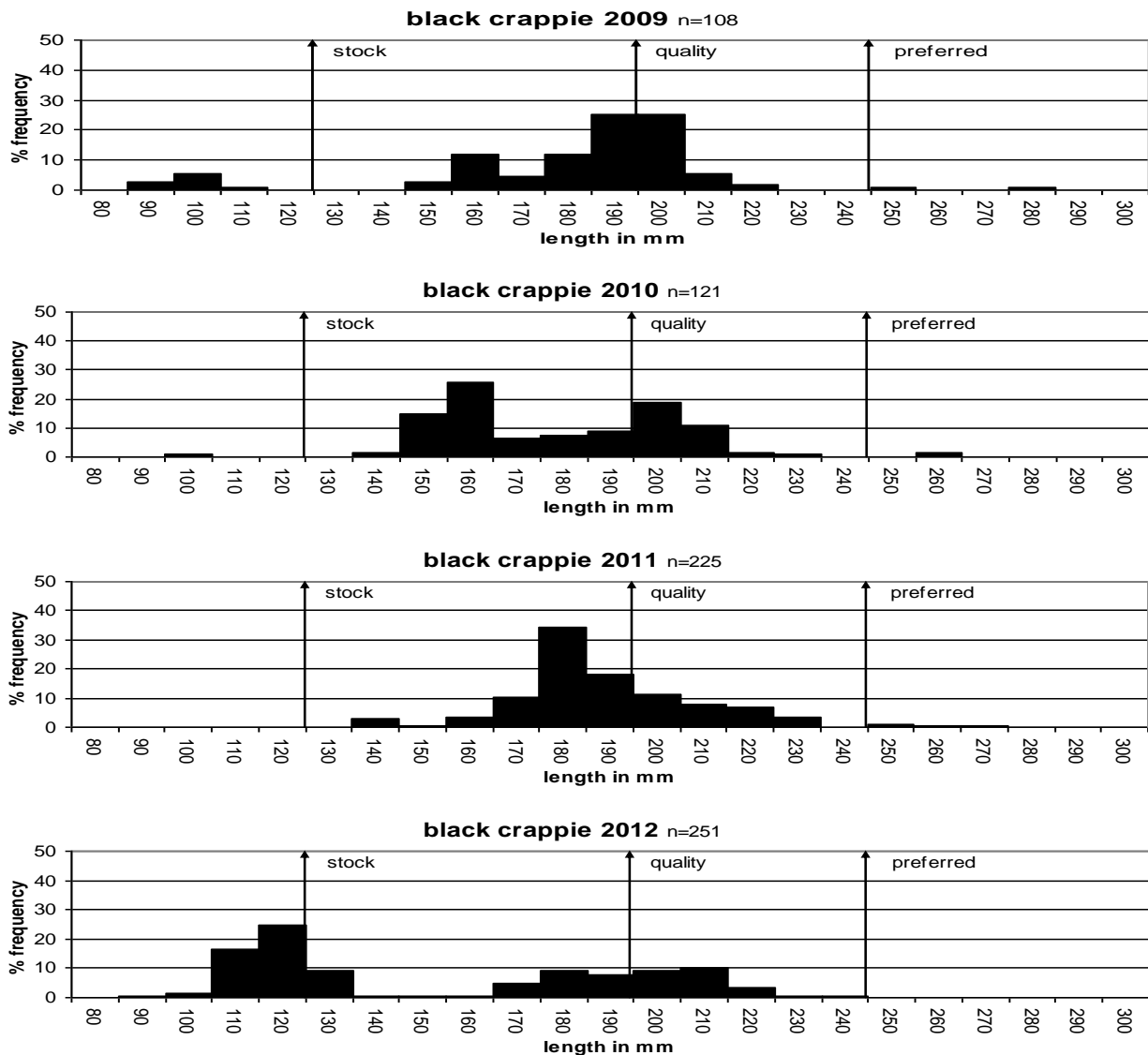


Figure 3. Length frequency histograms of Black Crappie from modified fyke nets at Curlew Lake, Meade County, South Dakota, 2009-2012.

Largemouth Bass

Since the winterkill of 2007/2008, Largemouth Bass fingerlings have been stocked for five consecutive years, totaling roughly 58,700 fingerlings. While water turbidity often results in poor catchability during boat electrofishing, a total of 44 largemouth bass were sampled in 38 minutes of electrofishing for a CPUE of 67.7 fish per hour (Table 4). Fish condition was excellent with $W\geq S$ of 118.7. The length frequency histogram indicates a large proportion of fish below 10 inches (Figure 4). As this population continues to increase in size structure and density it should continue to influence the Black Crappie and Black Bullhead populations and potentially maintain them within management objectives.

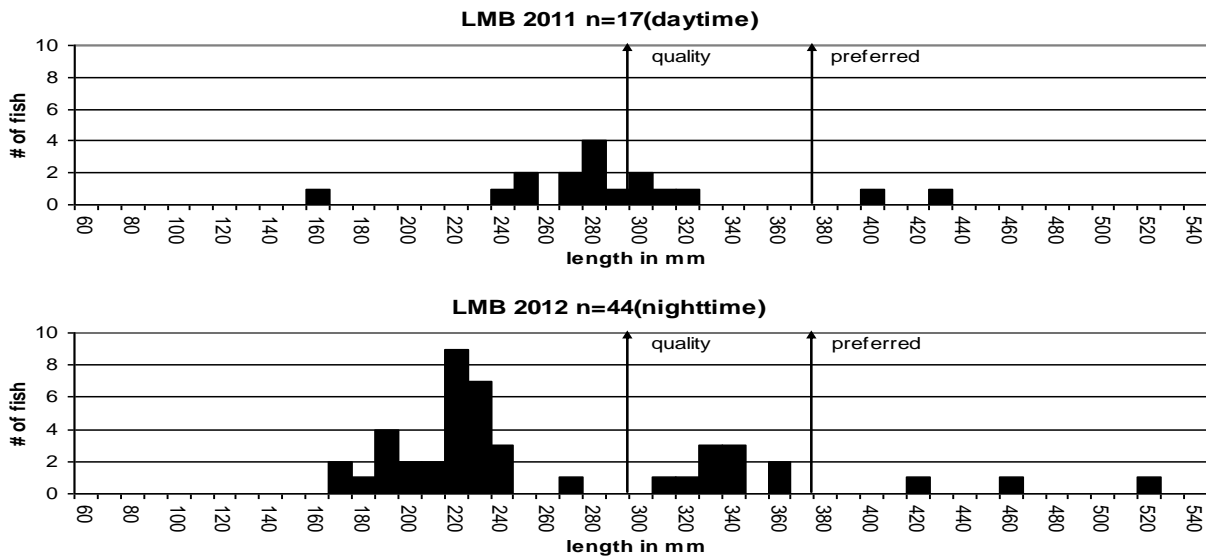


Figure 4. Length frequency histograms of Largemouth Bass collected during fall boat electrofishing at Curlew Lake, Meade County, South Dakota, 2011-2012.

Walleye

To increase Walleye abundance and size structure at Curlew Lake, a 14-inch minimum-length-limit was put in effect January 1, 2004. In 2010, that regulation changed to a 15-inch minimum and the daily limit was also dropped from four to two. Since the summer of 2008, 107,000 Walleye fingerlings have been stocked in an effort to increase walleye density and also increase predatory pressure on the Black Bullhead and Black Crappie populations. In 2012, gill nets CPUE increased to 4.5 from 1.5 in 2011 (Table 8). Otoliths aged from the gill net sample indicated slow growth (Table 9). Lengths of sampled Walleye show a population dominated by small fish (Figure 5). The population is still short of reaching management objectives, but recent stocking of Gizzard Shad may help increase growth and condition of Walleye by providing additional forage.

Table 8. Year, number sampled (N), catch per unit effort (CPUE), catch per net night of stock-length fish (CPUE-S) for Walleye collected by experimental gill nets in Curlew Lake, Meade County, South Dakota, 2008-2012. CPUE values with 80% confidence intervals in parentheses.

Year	N	CPUE	CPUE-S
2008	1	0.5 (0.3)	0.5 (0.3)
2009	11	5.5 (13.9)	0.0 (--)
2010	3	1.5 (4.6)	0.0 (--)
2012	9	4.5 (1.5)	4.5 (1.5)

Table 9. Age, length range and weighted mean length (mm) at capture for Walleye, based off otoliths, collected from experimental gill nets in Curlew Lake, Meade County, South Dakota, July 4-6, 2012.

Age	Minimum length range @ capture	Weighted mean length @ capture	Maximum length range @ capture	Number of fish in survey
4	254	326	395	8
7	690	690	690	1

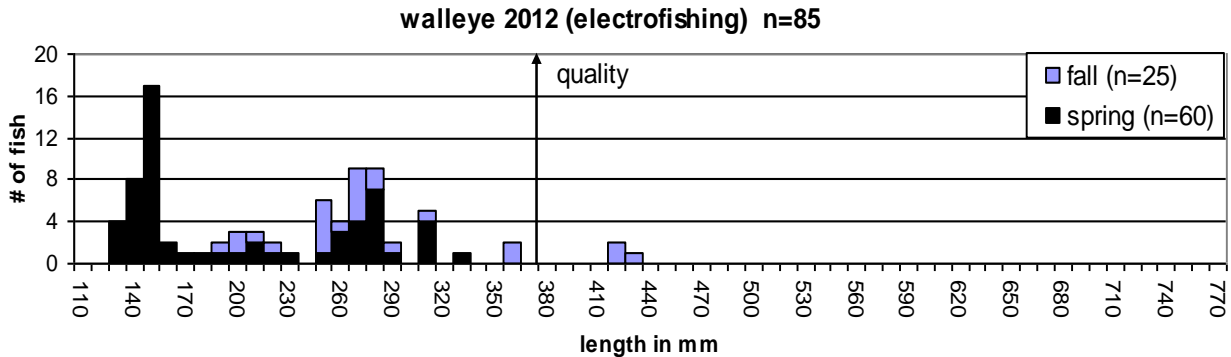


Figure 5. Length frequency histogram for Walleye sampled during boat electrofishing, by season, from Curlew Lake, Meade County, South Dakota, 2012.

RECOMMENDATIONS

1. Stock Walleye fingerlings to increase density and supplement any natural reproduction.
2. Stock 50 to 100 adult pre-spawn Gizzard Shad into Curlew Lake in spring of 2014.
3. Survey fish populations annually while Gizzard Shad stockings are being accomplished to document changes in fish populations (i.e. size structure, densities, growth, condition) that may be associated with Gizzard Shad as a new forage source.

APPENDIX

Appendix A. Stocking history, including Year, number stocked, specie and size of stockings occurring in Curlew Lake, Meade County, South Dakota, 2008-2012.

Year	Number	Species	Size
2008	46,990	Walleye	Fingerling
	13,000	Largemouth Bass	Fingerling
2009	70	Channel Catfish	Adult
	400	Yellow Perch	Adult
	150	Largemouth Bass	Adult
	23,960	Largemouth Bass	Fingerling
	46,260	Walleye	Fingerling
2010	250	Golden Shiner	Adult
	14,000	Walleye	Fingerling
	8,420	Largemouth Bass	Fingerling
2011	200	Channel Catfish	Adult
	1398	Yellow Perch	Adult
2012	54	Gizzard Shad	Adult
	13,320	Largemouth Bass	Fingerling